clam (Mya) from the shell heaps of Goose Island, Maine; Ipswich, Mass., and Marblehead, Mass., in comparison with recent forms of the same species collected in the immediate vicinity of these ancient deposits, showed that the ancient specimens were higher in comparison with their length than the recent specimens.

A comparison of the common beach cockle (Lunatia) from the shell heaps of Marblehead, Mass., showed that the present form had a more depressed spire than the recent forms living on the shore to-day, and this variation was in accordance with observations he had made on similar species in Japan.

AMERICAN COAL FIELDS.

The areas of the anthracite coal fields, confined to a few counties of our State, are so well defined that we need be in no doubt as to their extent; and this limited area admonishes us that we should carefully husband our inheritance, and not waste it. The fact is well established, that for every ton shipped to market, two are wasted. The loss in the operations of mining, the pillars left to support the roofs of the mines, the loss in preparation, each contributes to this great aggregate. How to prevent these losses, by use of improved machinery, and by more thorough methods of working the mines, should be the study of our mining superintendents and engineers. Several suggestions with a view to a partial remedy, present themselves.

First.—The owning of the land by the operators would make them careful to mine all the coals. As tenants for a limited term of years, their object is merely to take out that coal, and in such a manner as will cost them little, and bring them much.

Second.—If the lands are to be leased, the term should be long enough to enable them to mine all the coal beds covered by the lease.

Third.—The lease should contain clauses subjecting the methods of mining, ventilation and drainage to the supervision of the owner's mining engineers; limiting the lengths of "breasts" to seventy yards or less; forbidding the use of monkey rolls, or the rebreaking of the coal; providing for the dumping in separate heaps of the coal dirt and the slate and rock.

Fourth.—We need larger collieries, and fewer of them, with perfected machinery, for hoisting, pumping and breaking.

Fifth.—More capital is required to open the mines for extensive and exhaustive working, by driving the gangways to the extreme ends of the territory, and then mining towards the outlet, so as to obviate the necessity of retracing our steps and robbing the pillars.

In Schuylkill county we are specialists. We are dependent upon one substance: coal is king. There is no gold, silver, lead, copper, or other valuable metals. Though we have good iron ores, they are so disseminated as not to furnish us one workable bed. Yet we largely help Pennsylvania to furnish nearly half the iron manufactured in the United States. We have a large farming area well cultivated by our industrious and frugal German farmers. Our convenient location to the great markets of the Atlantic seaboard, our canals and abundant railroad facilities, our great commodity, always give a promise and an attitude among the great countries of our grand old commonwealth, which we are ever proud to realize.—*Geology of Schuylkill County, by P. W. Scheafer. Pottsville, Pa.*

The latest addition to microscope stands is the swinging sub-stage. This American invention has been adopted by most of the English manufacturers. In the last number of the *Journal of the R. M. S.* we find the value of the swinging sub-stages disputed by Mr. Crouch, and that Mr. Stevenson concurred in this view, and described them as useless incumbrances and unsuitable for use with certain apparatus, which is essential to the display of some objects.

ASTRONOMY.

COMET C (SCHÄBERLE), 1881.

This comet has been observed here since the 16th of July. When first seen it was large, round and bright, and slightly condensed at the centre, being very plainly visible in a 1¼-inch telescope. On the morning of the 19th it had increased sensibly in brightness; a faint tail could be traced for a distance of fully 15′, pointing in a northwesterly direction; on the above date its position was obtainee from θ (*Theta*) *Aurigas* in the following manner: Thd comet and star were separated too far to be both seen in the field of the telescope together, the comet was also too far north of the star for both objects to be seen at once in the finder. One of the wires in the finder eye-piece was made parallel with the meridian, and then the star, which preceded the comet, was brought into the field and its passage of the wire obtained; the telescope was then carefully moved northward in declination until the comet, entered the field when its passage of the wire was observed; in this manner the difference of R. A. was obtained; the difference of declination was then estimated. From a mean of several passages of the star and comet its position on July 18th at 15h. 40m., Nashville mean time, was found to be R. A. 5h. 52m. 52sec., and Decl. 40° 15′. The R. A. will be very little out, but the declination may be over a minute in error.

Its position was obtained in the same manner on the 20th (A. M.), using the same star at 3h. 35m., R. A. 5h. 53m. 54sec., Decl. + 40° 42′, with probably several minutes of error in the declination. On July 24, at 15 hours, the comet was visible to the naked eye, appearing about as bright as a sixth magnitude star (Prof. Swift, of the Warner Observatory, saw it with the unaided eye as early as the morning of the 23d).

On the 28th a small star-like nucleus was visible with the telescope.

Aug. 3 (A. M.), it was very easily visible with the naked eye, traces of the tail being seen without a telescope. A naked eye comparison with comet B showed C to be the brighter. Comparing it with a six magnitude star it was of the same brightness, but, covering a larger area, it was more noticeable than the star. The tail, in the telescope, was long and slender and straight as a shaft.

Aug. 4 (A. M.), the comet was quite conspicuous with the unaided eye, the tail stretching out for some distance. In the telescope the nucleus was small, round and pale, and star-like in form, Turning the telescope from comet C to comet B, the two were identical in brightness, but B was slightly broader about the head and tail, and the nucleus was not so distinct; but considering the low altitude of C it must have been really much brighter than B.

On August 14 it was visible in the evening after sunset, being quite plainly visible to the naked eye, with its tail streaming upwards for several degrees. In the telescope it was many times brighter than comet B.

21 inst., in the evening, the comet was as bright to the eye as a 3½ mag. star. It appeared very graceful, straight and slender in the telescope. On this occasion I obtained its position with the aid of a ring micrometer, referring the comet to *Psi ursæ minoris*.

1881, August 21 ds., 14.1m. Washington, m. t. $\left\{ \begin{array}{l} \alpha = 11h.\ 08m.\ 08.5s. \\ \delta = +45^\circ\ 13'\ 42'' \end{array} \right.$
This was the *apparent position.*

22 inst., evening, its tail could be traced with the telescope for a distance of about 6°, and was visible to the naked eye for about the same distance. A faint lightish stripe was visible on this date, extending from near the head to a degree or so along the middle of the tail. The following side of the comet's head and tail were distinctly defined, the sky appearing quite dark up to the very body of the comet, but the preceding side was ill-defined and blended, the sky being whitish for some distance from the comet; there also appeared to be a diffused sort of short tail running out some 10′ or so from the n. p. side

of the head ; the nucleus was small and not very well defined.

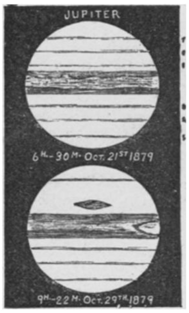
This comet differs considerably in general appearance from the comet now in *ursæ minor*. The head of B was large and broad, and its tail spread out greatly. Comet C has a small, narrow head with a very long slender shaft-like tail running from it in a straight line.

E. E. BARNARD.

NASHVILLE, TENN., *August* 26.

JUPITER.

The following cut represents the planet Jupiter on October 21st and October 29th, 1879, as seen with the 18½ inch Chicago refractor, with power 638.



The numbers on the right indicate the faint belts, which were systematically arranged on either side of the planet's equator.

The great Equatorial Belt, crossing the center of the disc, was composed of two separate belts, being divided by an irregular rift extending through the central portion. The color of this belt was reddish-brown-brick color, and the total width was 15,780 miles.

The great red spot shown in the center of the disc, on October 29th, was essentially of the same color as the equatorial belt, only more brilliant; it was about 30,000 miles in length and 8000 in breadth. Under fair atmospheric conditions, the equatorial belt was always visible up to the edge of the disc, with very slight diminution of color.

CORRESPONDENCE.

COMET *b*., 1881.

HARVARD COLLEGE OBSERVATORY,
CAMBRIDGE, U. S. *September* 13, 1881.

To the Editor of " SCIENCE."

SIR:—The spectrum of comet *b*, 1881, according to Dr. Konkoly (*Observatory*, 53, p. 257) contains five bright bands. From the mean of measures made with different spectroscopes on different nights, their wave-lengths in millionths of a millimetre were found to be 560, 545, 515, 472 and 468. The first, third and fourth of these bands are evidently due to carbon and, as Dr. Vogel has shown, are coincident with those of the banded stars of Secchi's fourth type. The other two bands appear to coincide with those of Ll. 13412. Last winter the spectrum of this star was found to consist mainly of bands having wave-lengths 545, 486 and 466 (*Nature*, xxiii, 604). The line 486 is probably due to hydrogen. The singular kinship of comets and banded stars is thus confirmed by a star whose spectrum seems to be quite unique.

EDWARD C. PICKERING.

To the Editor of " SCIENCE."

About two weeks ago, I found that one of the turtles which I keep for experimental purposes, a *Chrysemys picta* had laid eggs; all but one of these had been devoured whether by the turtle itself (as I have known to be the case with the same species, when kept in captivity) or by some alligators living in the same tank I could not discover. The perfect egg, I imbedded in moist sand, after carefully washing it, and finding yesterday, that it had not undergone development, I opened it and to my surprise found a living maggot, the larva probably of the *Musca vomitoria*, creeping around actively in the space between the half dessicated yolk and the shell membrane. It measured about four millimeters in length. As it crawled out of the aperture in the shell which I had made I threw the specimen away as it did not show the original anomoly.

Analogous observations have been made in the chick's egg. Cases are not infrequent where one egg has enclosed another or even several eggs, legs of beetles, wisps of straw and other foreign bodies. But this is I believe the first case where a living animal has been found in an egg. Of course the explanation of its presence is the same as in the case of the other substances referred to.

E. C. SPITZKA.

BOOKS RECEIVED.

ELEMENTS OF ALGEBRA, by G. A. WENTWORTH, A. M., PROFESSOR OF MATHEMATICS IN PHILLIPS EXETER ACADEMY, 8° BOSTON. Ginn & Heath, 1881 ; viii, 380 pp.

This addition to American a gebraic literature is the sort of book that is to be expected from a live teacher. It bears the stamp of experience upon it and gives evidence throughout of the one end and aim of teaching beginners in algebra the art of algebraic manipulation. We say the art rather than the science, because the aim is clearly to familiarize the pupil with the *art*, to teach him *how* to manipulate rather than to lay stress upon the reasons for the processes, the author being evidently a disciple of Thomas Hill in his belief "*Facts before reasoning*." This is shown by such statements as " From these it may be assumed, etc."; " It may be verified that, etc."

The author has paid "particular attention to brevity and perspicuity in definitions," a thing which cannot be too highly commended, and without which any algebra, however good in other respects, will not succeed.

This matter of definitions is, as every teacher understands, a very important matter, if not for the algebra itself, then at least as a matter of right training and clear thinking. Definitions should be memorized, but memorization is not enough ; they must be thoroughly understood. With those teachers who do not agree with this view we will have no disagreement, for the student trained to thoroughly comprehend is generally found by that very process to have secured that definition in his memory. In a text book, therefore, which aims at clearness and brevity in definition, a valuable training is afforded the student by leading him to carefully weigh the definitions ; to consider whether the definition can be curtailed without loss of clearness, or whether it be not already too brief to be intelligible ; to consider whether it is too restricted or too extended in its application, etc.

With the view of emphasizing this important matter we shall call attention to some of the definitions in this book, and at the outset let us premise that the definitions of mathematical terms must conform to the usage of mathematicians. It is a well-known fact that certain features of text books, faults as well as excellencies, are faithfully reproduced. Witness the statement concerning the rotation period of one of the major planets, erroneously given in one of the earlier editions of "*Herschell's Outlines*," and this error faithfully copied into astrono-